THE CLAIMS

What is claimed is:

1. A method of separating a first sample comprising nucleic acids, the method comprising:

providing a matrix that is essentially free of denaturing agents;

raising a temperature of a first portion of the matrix to at least about 80 °C;

subjecting the nucleic acids to electrophoresis through at least the first portion of the matrix while the temperature of the first portion is at least about 80 °C; and

deliberately cooling a second portion of the matrix to less than about 30 °C, the nucleic acids migrating through the second portion after they have first migrated through the first portion.

2. The method of claim 1, wherein the first portion of the matrix is raised to a temperature between 80 °C - 90 °C.

3. The method of claim 1, wherein the matrix comprises at least one random, linear copolymer comprising a first comonomer of acrylamide and at least one secondary comonomer.

4. The method of claim 1, wherein the second portion of the matrix is cooled to less than about 25 °C.

5. The method of claim 1, wherein the matrix is completely free of denaturing agents.

6. The method of claim 1, further comprising subjecting a second sample of nucleic acids to electrophoresis within the same matrix, after the first sample has been electrophoresced.

7. The method of claim 6, comprising subjecting a total of at least 25 additional samples of nucleic acids, one at a time, without replacing the matrix.

8. The method of claim 7, wherein the temperature of at least a portion of the polymer matrix in which the second sample is electrophoresced is at least about 80 °C.

9. A method of separating a first sample comprising nucleic acids, the method comprising:

subjecting the nucleic acids to electrophoresis using a matrix that is essentially free of denaturants, the matrix having at least one random, linear copolymer comprising a first comonomer of acrylamide and at least one secondary comonomer, wherein a temperature of at least a portion of the matrix is at least about 80 °C.

10. The method of claim 9, wherein the comonomers are randomly distributed along the copolymer, and wherein the at least one secondary comonomer is selected from the group consisting of vinyl monomers, monomers of acrylamide derivatives, monomers of acryloyl derivatives, monomers of acrylic acid derivatives, monomers of polyoxides, monomers of polysilanes, monomers of polyethers, monomers of derivatized polyethylene glycols, monomers of cellulose compounds, or mixtures thereof, each having between 2-24 carbon atoms.

11. The method of claim 9, wherein the at least one secondary comonomer is N,N-dimethylacrylamide monomer.

12. The method of claim 11, wherein the polymer is a copolymer polymerized using about a 1:1 ratio of acrylamide and N,N-dimethylacrylamide monomer.

13. A method of sequencing a sample comprising nucleic acids, comprising:

providing a matrix that is essentially free of denaturing agents, the matrix having at least one random, linear copolymer comprising about a 1:1 ratio of acrylamide and N,N-dimethylacrylamide monomer, and a buffer having a pH of at least about 8, a temperature of at least a portion of the matrix being at least about 80 °C;

subjecting the nucleic acids to electrophoresis through said matrix; and

prior to detecting the nucleic acids, deliberately cooling a second portion of the matrix to less than about 25 °C, the second portion of the matrix receiving nucleic acids from the heated portion of the matrix.

14. A method of separating a plurality of samples of biological compounds, comprising:

providing a matrix that is essentially free of denaturing agents;

subjecting a first sample to electrophoresis through said matrix, the first sample comprising nucleic acids, and wherein a temperature of a first portion of the matrix is sufficient to substantially denature the nucleic acids; and

subjecting a second sample to electrophoresis in a separate step but through the same matrix, the second sample comprising a complex of at least two biological compounds.

15. The method of claim 14, wherein the temperature is from about 80 °C to about 99 °C.

16. The method of claim 15, wherein the temperature is from about 80 °C to about 90 °C.

17. The method of claim 15, further comprising

deliberately cooling a second portion of the matrix to less than about 30 °C, the first and second samples migrating through the second portion after each has first migrated through the first portion.

18. The method of claim 17, wherein the second portion of the matrix is cooled to less than about 25 °C.

19. The method of claim 15, wherein the complex comprises at least one of a nucleic acid-protein complex and a protein-protein complex.